BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C.

In the Matter of:	)	
	)	
AMENDMENT OF THE COMMISSION'S RULES TO ESTABLISH A SINGLE AM RADIO STEREOPHONIC TRANSMITTING EQUIPMENT STANDARD	)	**ET DOCKET NO. 92-298**
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To: The Commission

COMMENTS OF COMMUNICATIONS TECHNOLOGIES, INC.

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COMMENTS OF COMMUNICATIONS TECHNOLOGIES, INC.

The broadcast engineering consulting firm of *Communications Technologies, Inc.* ("CTI"), on behalf of the listed clients, opposes the adoption of the Motorola System for stereophonic

broadcasters. It was believed that adoption of a standard would move manufacturers to build AM stereo receivers, radio stations to install stereo transmitting equipment, and the public to buy these receivers and listen to the new improved sound of AM stereo.

3. In the following pages, it will be demonstrated that implementation of a new stereo standard, as proposed, will not result in the desired end result and may result in a false start with tragic end consequences for AM stations.

I. BACKGROUND - WHY HAS AM LISTENERSHIP DECLINED

4. On July 18, 1990, the Commission began a wide ranging study of the AM band under MM docket No. 87-267. In the introduction of the PRM, the Commission states that the purpose of the Rule Making was "... the transformation and revitalization of the AM broadcast service by the year 2000." The Commission went on to say:

> "During the last twenty years, however, channel congestion, interference and low fidelity receivers have taken their toll, dulling the competitive edge of this once vital service. Not surprisingly, once loyal AM listeners have shifted their allegiance to newer mass media services that offer them higher technical quality." (Emphasis added.)

and,

> "... For the past several years the Commission has involved itself in an intensive effort to identify the service's most pressing problems and the sources of and solutions to those problems. In September of last year we challenged broadcasters, radio manufacturers and the listening public to tell us how we could revitalize the AM radio service. In an *en banc* hearing lasting a full day

in November they responded to the challenge. Their response reaffirms our conviction that a concerted effort by this Commission, the broadcasting community and radio manufacturers can rejuvenate the AM radio service."

5. After great deliberation, and review of comments from many parties, the Commission issued a Report and Order in MM Docket No. 87-267 concluding the proceeding and establishing new technical standards for AM broadcasting. The Order was released on October 25, 1991 and may be summarized as follows with regard to matters that affect signal quality and listenership:

A. New allocation standards under Part 73 were set to minimize interference between stations.

B. Migration to the expanded band, 1605-1705 kHz, was set forth as a goal with stations in the expanded band to enjoy wide area, interference free, full-time service.

C. Interference in the 535-1605 kHz band to diminish as stations make facility changes or migrate to the expanded band.

D. AM stereo given a preference for the expanded band, optional for the existing AM band.

E. Good receiver quality identified as essential to the success of any broadcast service. Commission supports NRSC standards.

6. In Section VI of the Report and Order, the Commission set forth the case for AM stereo:

> "Many commenters opposed a requirement for mandatory provision of AM stereo service. Most cited economic considerations as their reason for opposing the mandatory requirement."
>
> "Arguments of economic hardship are very persuasive for stations remaining in the existing band, since many of these stations are already in precarious financial situations and cannot afford the cost of converting their facilities to stereo operation."
>
> "However, in the case of AM stations that are migrating to the expanded band, we believe that there is a compelling reason to provide an incentive for the use of AM stereo. In our view, AM stereo is a valuable asset. Our objective is to create an environment that is competitive with other sources of audio entertainment. Failure to encourage use of AM stereo would send a signal to receiver manufacturers and the public that we are less than completely committed to the provision of a fully competitive service in the expanded band. Additionally, AM stereo operations in the expanded band would provide receiver manufacturers with an added incentive to produce receivers capable of stereo reception for the entire AM band. Accordingly, while we encourage stereo operation in the existing band, we will provide a specific preference for stereo proponents in the expanded band." (Emphasis added.)

7. We will compare the Commission's goal of "creating an environment that is competitive with other sources of audio entertainment" to the result which would occur by implementing the Motorola system, as proposed, later in these comments. For the moment

A. To determine the weight which should be attached to the 11.5 percent who have chosen Motorola, we should know:

1. When the initial purchase decision was made. Were most of the purchases made many years ago with fewer purchases made in successive years indicating an overall dissatisfaction with the product?

2. Of the 591 users, how many are still broadcasting with the system? Are they satisfied with the quality of the stereo signal?

B. What is the choice of the majority? Why has the majority, 4,553 stations, not purchased the Motorola system?

12. **CTI** recommends that the Commission extend the comment and reply comment periods to the extent necessary that the Office of Engineering Technology publish an empirical and theoretical analysis of the Kahn and Motorola systems. To do otherwise is to commit the United States to a standard while wearing technical blinders. Implementation of this standard, alone, as proposed, would further the demise of AM radio. The approach should be the progressive, "big picture", one taken by the Commission in the HDTV proceeding.

III. RECEIVED SIGNAL QUALITY

13. The NPRM sets forth a stereo broadcasting standard only. In MM Docket No. 87-267, the Commission clearly stated that its priority was to bring AM broadcasting up to the level where it could compete with other audio services for listeners. It is our view that implementation of a stereo broadcasting standard alone is not enough to achieve this end. In fact, establishing a transmission standard alone may cause a false start with manufacturers building more receivers only to find that listener interest is short-lived because the overall

received signal quality is still poor. The long term effect would be a further demise in AM station listenership.

14. For an AM stereo standard to have meaning and practical benefit to the end user, the entire transmission system must be addressed, transmitter and receiver. It is strongly recommended that the final AM stereo standard which is adopted include the receiver standards outlined in the following section.

IV. RECEIVER STANDARDS

15. It is recommended that the existing NAB/EIA "AMAX" certification standards be implemented as part of this proceeding. The standards may be summarized as follows with the full standard appearing in Appendix B:

I. NRSC bandwidth

II. Variable bandwidth control

III. AM/FM stereo capability

IV. AM noise blanking

V. External antenna capability

VI. Expanded AM band capability

V. SKYWAVE INTERFERENCE

16. The final stereo standard, which is to be implemented, must be robust and able to deliver a consistent signal under skywave interference conditions. This is not just a nighttime signal problem as might be first expected.

17. The issue of skywave interference is especially critical in the expanded band and has always been critical at the upper end of the AM band as well. Skywave signals are

considered to exist for a period of two hours after local sunrise and to begin two hours prior to local sunset. The importance of skywave interference during this time period may be seen in Section 73.187 of the Rules, "Limitation on Daytime Radiation". The four hours of the day that skywave interference exists are called "critical hours".

18. The procedure outlined in Section 73.187(b) of the Rules can be used to show the dramatic increase in skywave interference as frequency increases. The calculations are for a 90 degree tower and an east west propagation path:

Frequency kHz	Allowable Radiated Field Strength in mV/M	Allowable Power in Kilowatts
640	1,913	101
1000	782	16.9
1580	316	2.8

19. This table indicates that 2.8 kW on 1580 causes the same amount of skywave interference during critical hours as 101 kilowatts on 640 kHz.

20. The Commission is strongly promoting AM stereo for the expanded band where critical hours skywave interference will be great. The proposed 10 kW non-directional daytime stations planned for the expanded band will experience wide area, critical hours, interference for 4 hours of the day, or more.

21. The Motorola system suffers from platform motion when the desired to undesired signal ratio falls below 26 dB or blends to mono. This is the ratio of desired to undesired signals for co-channel operation; the 0.025 mV/m contour cannot overlap the 0.5 mV/m contour or the 5 uV/m to the 200 uV/m contour of clear channel stations. From the Section 73.187 calculations shown in paragraph 18 above, we know that during critical hours the ratio of desired to undesired signals may fall to 20 dB, or less, at the protected contour.

22. Many modern day Motorola system receivers blend from stereo to mono to alleviate platform motion at the approximated 26 dB signal ratio point. This is an important point to consider. The Commission is recommending that AM stereo be used in the expanded band to increase listenership, yet the Motorola system will be muted to mono over significant portions of the service area during critical hours. Clearly, this is not the desired end result.

23. To determine how significant the stereo service curtailment will be, detailed interference calculations must be made for critical hours as well as nighttime hours operation. These calculations will show the locations of specific desired to undesired signal levels or contours. This data should then be compared to measured lab performance test data for receivers with mono, Motorola and Kahn decoders. The final result will be service area projections for each type of service.

24. It is basic engineering to investigate the effect on overall coverage area associated with each stereo system and to employ those results in selecting the AM stereo transmission standard.

VI. FUTURE DAB COMPATIBILITY

25. It is believed fair to state that most broadcasters see the future of broadcasting through digital glasses. Immense strides have been made in the last one to two years which indicate that an AM band, digital stereo system, will be perfected. A successful AM band, digital, stereo system must be compatible with the existing AM modulation scheme to allow simulcasting while the receiver base builds. In practical terms, it could be 10 to 15 years from now before the receiver base builds to the point that regular AM modulation would no longer be used.

26. No AM station wants to be in the position of installing a stereo system which is mutually exclusive with digital stereo broadcasting. A station which is operating with only AM

stereo, for years, while competitors are operating with AM mono and digital stereo, will be at a severe disadvantage in a competitive market.

27. Discussions with one AM band digital proponent, and a general review of digital modulation theory, tells us that a Motorola stereo signal is not likely to be compatible with the digital stereo signal. A Motorola system user could be forced to choose between AM stereo or digital stereo, while his competition would be promoting regular AM with simulcast digital stereo.

28. The Kahn system is the superior choice in this regard. The system does not need a stereo pilot signal and it is not a phase separation system. Receivers incorporating the Kahn detector circuit, due to the inherent system design, will receive either stereo or mono, depending on the characteristics of the transmitting station.

29. This apparent superiority of the Kahn system needs to be scrutinized carefully by the Commission and commenters, and made a part of the stereo system selection process.

VII. KAHN POWER SIDE

30. It is clear from the PRM that the Commission does not intend to force broadcasters to install AM stereo. Neither FM or TV stations are required to operate with stereo.

31. In the FM and TV bands, the spectrum occupied by the station is essentially its own to utilize as it sees fit as long as the occupied bandwidth emission standards are met. Ancillary uses include many subcarrier services.

32. In the same way, AM broadcasters need to be able to use their channel as they see fit as long as normal reception is not impaired and occupied bandwidth requirements are maintained. CTI and its clients object to paragraph 7 of the PRM where it is stated that only the Motorola system may be used one year or more after the effective date of the new stereo rules.

33. Many stations around the country are utilizing the Kahn Power Side system which is a modification of the Kahn stereo system. This system has empirically proven itself and provides improved AM reception in many circumstances. These stations have invested tens of thousands of dollars to install the Kahn Power Side system in an effort to improve service to the public while, in many cases, reducing energy consumption.

34. There is no technical reason to take away these stations' improved facilities. All occupied bandwidth regulations are clearly complied with. The only result that can occur by prohibiting systems which improve the AM signal is damage to the AM band in terms of lost listeners and station revenue.

35. The Act requires that a single AM stereo standard be established. It does not speak to modulation enhancement, or received signal enhancement technologies such as the Kahn Power Side and should not be used as an excuse to remove these systems from service when they have served their stations so well.

VIII. FINAL RECOMMENDATIONS

36. The following recommendations summarize the points discussed in these comments:

1. The choice of an AM stereo standard should be based on technological decisions. The FCC Labs should test the Motorola and Kahn stereo systems side by side and provide laboratory and empirical listening results for evaluation by the broadcast community.

2. A receiver standard must be implemented with the stereo transmission standard. Failure to implement one complete standard will leave the American public with a second rate signal quality from AM. Simple circuits such as noise blanking, NRSC bandwidth and distortion and variable bandwidth control are critical to improved signal reception.

3. The effects of skywave interference, especially during critical hours, need to be studied carefully to avoid implementing a standard which will be unable to provide true stereo operation.

4. The AM stereo standard that is adopted must be compatible with in band digital stereo to allow for a simulcasting period while the receiver base builds.

5. Modulation enhancement/received signal enhancement systems, such as the Kahn Power Side, must not be precluded by the new AM stereo system standard or rules.

IX. CONCLUSION

37. In conclusion, CTI hopes that the Commission will give serious consideration to these comments. Many of the client stations employ the Kahn Power Side and are seriously concerned about the potential loss of this valuable system. All of the clients are concerned about the possibility of adopting a standard which will further damage the AM service through improper technical review and/or lack of companion receiver standards.

headed by a chief having the following duties and responsibilities:

(a) To identify and define significant communications policy issues in all areas of Commission interest and responsibility;

(b) To conduct technical, economic, and sociological impact studies of existing and proposed communications policies and operations, including cooperative studies with other staff units and consultant and contract efforts as appropriate;

(c) To develop and evaluate alternative policy options and approaches for consideration by the Commission;

(d) To review and comment on all significant actions proposed to be taken by the Commission in terms of their overall policy implications;

(e) To recommend and evaluate governmental (state and federal), academic, and industry sponsored research affecting Commission policy issues;

(f) To prepare briefings, position papers, proposed Commission actions, or other agenda items as appropriate;

(g) To manage the Commission's policy research program, recommend budget levels and priorities for this program, and serve as central account manager for all contractual policy research studies funded by the Commission;

(h) To coordinate the formation and presentation of Commission positions in domestic communications policy; represent the Commission at appropriate interagency discussions and conferences.

(i) To participate in the development of international communications policy with the Office of Engineering and Technology, as appropriate; provide representation at international meetings when appropriate.

(j) Develop and recommend procedures and plans for the effective handling of policy issues within the Commission.

[38 FR 17005, June 28, 1973, as amended at 45 FR 25400, Apr. 15, 1980; 51 FR 12615, Apr. 14, 1986]

Office of Engineering and Technology

§ 0.31 Functions of the Office.

The Office of Engineering and Technology has the following duties and responsibilities:

(a) To evaluate evolving technology for interference potential and to suggest ways to facilitate its introduction in response to Bureau initiatives, and advise the Commission and staff offices in such matters.

(b) Represent the Commission at various national and international conferences and meetings devoted to the progress of communications and the development of technical and other information and standards, and serve as Commission coordinator for the various national conferences when appropriate.

(c) To conduct scientific and technical studies in advanced phases of terrestrial and space communications, and special projects to obtain theoretical and experimental data on new or improved techniques.

(d) To advise the Commission concerning engineering matters, including the privacy and security of communications, involved in making or implementing policy or in resolving specific cases.

(e) To develop and implement procedures to acquire, store, and retrieve scientific and technical information useful in the engineering work of the Commission.

(f) To advise and represent the Commission on frequency allocation and spectrum usage matters, including those covered by international agreements.

(g) To render, in cooperation with the General Counsel and the Office of Plans and Policy, advice to the Commission, participate in and coordinate staff work with respect to general frequency allocation proceedings and other proceedings not within the jurisdiction of any single bureau, and render service and advice with respect to rule making matters and proceedings affecting more than one Bureau.

(h) To collaborate with and advise other Bureaus and Offices in the for-

mulation of technical requirements of the Rules.

(i) To administer Parts 2, 5, 15, and 18 of this chapter, including licensing, recordkeeping, and rule making.

(j) To perform all engineering and management functions of the Commission with respect to formulating rules and regulations, technical standards, and general policies for Parts 15 and 18 of this chapter, and for type approval and acceptance, and certification of radio equipment for compliance with the Rules.

(k) To maintain liaison with other agencies of government, technical experts representing foreign governments, and members of the public and industry concerned with communications and frequency allocation and usage.

(l) To calibrate and standardize technical equipment and installations used

procedural rules of general applicability and to review all rules for consistency with other rules, uniformity, and legal sufficiency.

(f) To conduct research in legal matters as directed by the Commission.

(g) In cooperation with the Chief Engineer, to participate in, render advice to the Commission, and coordinate the staff work with respect to general frequency allocation proceedings and other proceedings not within the jurisdiction of any single bureau, and to render advice with respect to rule making matters and proceedings affecting more than one bureau.

(h) To perform all legal functions with respect to experimental operations under Part 5 of this chapter; the operation of restricted radiation devices under Parts 15 and 18 of this chapter; and type approval and type

ELECTRONIC INDUSTRIES ASSOCIATION

NAB/EIA "AMAX" Certification Mark

The purpose of this document is to describe the content of the NAB/EIA "AMAX" high quality AM certification mark. A receiver manufacturer is eligible to use AMAX and benefit from radio station AMAX promotion if the candidate receiver contains the below-specified technologies and features.

Radio industry promotion of AMAX begins in the early fall of 1991. It is designed to assist consumers in identifying high quality AMAX receivers and to promote the sale of receivers that meet the AMAX requirements.

Here are the AMAX requirements:

I. NRSC Receiver Standard.

Receivers that meet the requirements of AMAX must comply with the provisions of the AM voluntary bandwidth and distortion receiver standard developed by the National Radio Systems Committee (NRSC), as determined by applicable NRSC measurement techniques. See EIA Interim Standard IS-80.

However, manufacturers of receivers for mobile environments, such as automobile receiver manufacturers, may employ a minimum audio bandwidth of 6.5 kHz for a period of three years from September 30, 1991, and remain eligible to use the certification mark.

II. Bandwidth Option and Control.

Receivers that meet the requirements of AMAX must have some provision for the control of AM bandwidth. This control can be manual or automatic, and should include at least two positions, such as "narrow" and "wide" bandwidth.

III. AM/FM Stereo Capability.

Receivers that meet the requirements of AMAX, and have an FM tuning capability, must also have an AM tuning capability.

AM Stereo is an optional enhancement for AMAX receivers. If the AM receiver uses AM Stereo technology, the certification mark becomes "AMAX Stereo."

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IV. AM Noise Blanking.

Receivers that meet the requirements of AMAX must employ noise blanking technology. AM "Noise Blankers," sometimes known as impulse noise suppressors, consist of circuitry in amplitude modulation receivers that analyzes the average level of the modulated R.F. or I.F. carrier wave, and compares it to the wave's instantaneous peak level. Peaks above a selected threshold level are detected as noise bursts, and if they are within a selected time duration, additional circuitry is activated to interrupt one or more of the R.F., I.F., and/or the demodulated audio path for the period of the noise burst. In most applications, the time duration of the individual path interruptions can be adjusted to minimize the effects that would cause short interruptions to the demodulated audio at the receiver audio output, making use of available delays in the receiver signal path. This creates a system that significantly eliminates noise bursts, while at the same time is unnoticed by most listeners. Any effective noise blanking technology may be employed.

V. External Antenna Capability.

Receivers that meet the requirements of AMAX must have the facility to connect an external AM reception antenna, provided the receiver also has the facility to connect an external FM antenna. Receivers which use telescoping whip or headphone cord FM antenna systems are exempt from this requirement, as are those receivers that do not provide a means of FM antenna connection that is specifically intended to interface with an external receiving antenna.

As with the FM antenna input connection, the AM antenna input on certified receivers should utilize a connection scheme that is familiar to consumers, e.g. screw terminals/posts or RCA/miniature phone jacks. The input impedance is to be 75 ohms. Standard precautions must be taken to insure that the input connection is isolated from hazardous voltages, as is required by Underwriters Laboratories.

VI. Expanded AM Band Capability.

Receivers that meet the requirements of the AMAX program must have the capability to receive frequencies of the expanded AM band, 1605 to 1705 kHz. There are ten (10) individual carrier frequencies in the expanded AM band. They are spaced every 10 kHz beginning at 1610 kHz and ending at 1700 kHz.

* * *

APPENDIX C

LIST OF CLIENT SUBSCRIBERS

The following clients of *Communications Technologies, Inc.* have directed the preparation and filing of the preceding comments and subscribe to the positions set forth therein.

Alchemy Communications Limited Partnership # 1, Licensee of WKIX (AM) and WYLT (FM), Raleigh, North Carolina.

Connoisseur Communications, Corporation proposed assignee of the following AM licenses:

KTEK	Alvin, Texas
WDCT	Fairfax, Virginia
KCNW	Fairway, Kansas
KNRB	Fort Worth, Texas
KYCR	Golden Valley, Minnesota
WYLO	Jackson, Wisconsin

Douglas Broadcasting, Inc., licensee of the following AM stations:

WNJR	Newark, New Jersey
WNDZ	Portage, Indiana
KEST	San Francisco, California

Universal Broadcasting Corporation, licensee of the following AM stations:

WSYW-AM	Indianapolis, Indiana
WTHE-AM	Mineola, New York
WVNJ-AM	Oakland, New Jersey
KPPC-AM	Pasadena, California